Modeling Dendritic Growth

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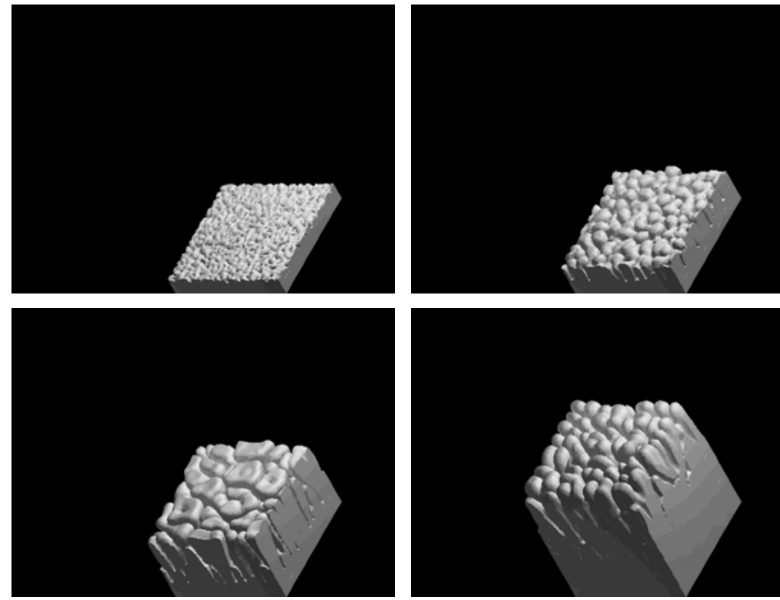
Research:

Dendrites are the predominant growth pattern in metals and alloys, and their morphology determines properties in real products. We use advanced parallel and adaptive computing techniques to simulate the evolution of these microstructures.



Simulating growth:
Figures show a time sequence for the evolution of an alloy solidification microstructure from initially random conditions in 3D. Notice the self-organizing structure and tip-splitting mechanism for pattern selection.

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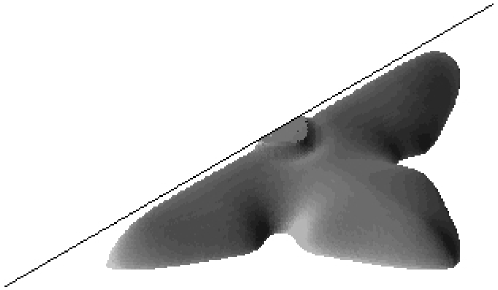
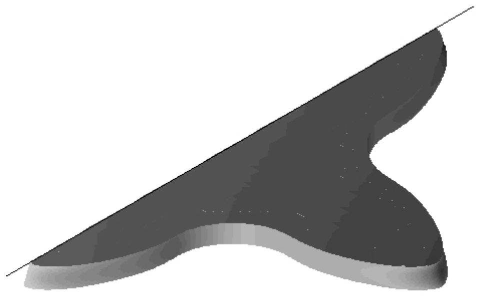
Many experiments are performed in a thin section between microscope slides. In our simulations, we find that when the slide separation distance becomes small, there is a transition from 3D to 2D growth. This strongly affects the interpretation of the results. These figures illustrate the difference in morphologies at large and small slide separation.



3D growth at large spacing



2D growth at small spacing